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Occurrence and Distribution of Weedy Rice in Kyonggi Region

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ABSTRACT

Distribution and occurrence of weedy rice in Kyonggi region were surveyed in 1996. Weedy rice was observed in 1368 fields (54.9%) of total 2490 fields. Almost two thirds of paddy fields in northern mountainous region were contaminated by weedy rice and more severe contamination, three forths of paddy fields, was observed in suburban regions. In those regions, occurrence of weedy rice was greater than those in north-eastern inland and south-western plain regions. The occurrence of weedy rice was higher in water seeding cultivation (66.7%) than other cultivation methods. The number of weedy rice per 10a was 756.7 plants in direct seeding on dry paddy and 379.4 plants in water seeding. The occurrence of weedy rice was higher in fields planted by farmer's seeds than that of paddy fields cultivated by certified seeds, and the longer the farmer's seeds being used, the more weedy rice occurred in paddy field.

Key words : weedy rice, red rice, off-type rice.

Direct rice seeding cultivation practiced widely in at present is a low-input and labor-saving rice cultivation technique, but has some disadvantage such as lower yields and lack of cultural stability. Weedy rice has increased under direct rice seeding cultivation due to difficulties in the early field management for water and germination control. In addition, a number of paddy fields are being managed with little due to higher mean age of farmers overall and a greater proportion of women managing fields. The occurrence of red rice and off-type rice has increased not only in direct-seeded paddy fields but also in transplanted paddy fields (Kim, 1989; Suh et al., 1997).

Weedy rice shows discernible characters compared to cultivated rice, including reddish seed coat of brown rice, easy shattering and low yield capacity. Weedy rice have been considered as a troublesome weed in rice cultivation (Heu et al., 1985; Son et al., 1995; Suh et al., 1992a; Suh et al., 1992b). Weedy rice have intermediate characters between cultivated rice and wild rice (Heu et al., 1985; Heu et al., 1991). According to Korean ancient books on agriculture, farmers tried to get rid of red rices as a way of improving rice quality (Kim, 1989; Suh et al, 1997).

Weedy rice that has reddish seed coat generally called "Angmie" means red rice, and is called "Sharei-byeo" in Kanghwa (Kim, 1989; Heu et al, 1985; Suh et al, 1992a). Park et al. (1994) and Cho et al. (1993) reported that ecotype of weedy rice was a mixture of japonica and indica based on banding patterns of esterase isozyme of collected weedy rice.

The objectives of this study were to survey distributions and occurrence of weedy rice in rice paddy field in Kyonggi region and to investigate their agronomic and developmental characteristics. The results of this study may be useful information for management of weedy rice.

MATERIALS AND METHODS

A field survey was conducted in 2,490 paddy fields from 23 counties or city located in Kyonggi-do in 1996. Paddy fields surveyed were sampled by the proportional stratified sampling method according to cultural methods and the size of paddy field. Weedy rice was counted in the fields and samples were collected for the use in further analysis.

Distribution of weedy rice was classified based on agronomic regions ; northern mountainous region, NM ; suburban region, SU ; north-eastern inland region, NE ; and south-western plain region, SW. Transplanting time, seed quality and rice cultivation methods (transplanting of 35-day-old seedling, transplanting of infant seedling, direct seeding on dry paddy, and water seeding) practiced in the survey year were also recorded.

RESULTS AND DISCUSSION

The occurrence of weedy rice (red rice and off-type rice) in the paddy fields is shown in Table 1. Weedy rice was observed in 1,368 fields (54.9%). Among the 1,368 fields that contained weedy rice, red rices occurred in 505 fields, off-type rices in 543 fields, and both weedy rice types in 320 fields.

The occurrence of weedy rice classified by agronomic regions of Kyonggi-do is shown in Table 2. The percent of paddy fields contaminated by weedy rice was 67.2% in NM and 75.6% in SU regions. In those regions, occur-

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Table 1. The occurrence of weedy rice in surveyed fields.

Total no. of surveyed fields	No. of fields without weedy rice	No. of fields with weedy rice			
		Off-type rice	Red rice	Off-type+red rice	Sub total
2,490 (100)	1,122 (45.1)	543 (21.8)	505 (20.3)	320 (12.8)	1,368 (54.9)

Table 2. Distribution of weedy rice in different agricultural regions in Kyonggi region.

Classification	No. of surveyed fields	No. of fields with weedy rice (%)	No. of weedy rice plants per ha (hill, %)		
			Off-type rice	Red rice	Sub-total
Total	2,490	1,368 (54.9)†	361 (0.15)‡	728 (0.31)	1,089 (0.46)
Northern mountainous region	390	262 (67.2)	39 (0.02)	254 (0.11)	293 (0.13)
Suburban region	521	394 (75.6)	343 (0.14)	391 (0.16)	734 (0.30)
North-eastern inland region	566	266 (47.0)	306 (0.13)	837 (0.35)	1143 (0.48)
South-western region	1,013	446 (44.0)	600 (0.25)	1289 (0.54)	1889 (0.79)

† Percent of fields infested by weedy rice of total number of surveyed fields.
‡ Percent of weedy rice plants of total rice plants per ha.

Table 3. Distribution of weedy rice in different cultural practice.

Cultural practice	No. of surveyed fields	No. of fields with weedy rice(%)	No. of weedy rice plants per ha (hill, %)		
			Off-type rice	Red rice	Sub total
35-day old seedling	2,238	1,244 (55.6)†	367 (0.16)‡	533 (0.22)	900 (0.38)
Infant seedling	168	73 (43.5)	28 (0.01)	291 (0.12)	319 (0.13)
Direct seeding on dry paddy	45	25 (55.6)	1,304 (0.55)	6,263 (2.63)	7,567 (3.18)
Water seeding	39	26 (66.7)	56 (0.02)	3,738 (1.57)	3,794 (1.59)

† Percent of fields infested by weedy rice of total number of surveyed fields.
‡ Percent of weedy rice plants of total rice plants per ha.

rence of weedy rice was greater than those in NE and SW regions that have more paddy fields than the previous two regions. The number of weedy rice plants per unit area in NE and SW region was higher than other regions, and similar observations were found in the occurrence of off-type and red rices.

These results are summarized as NM region and SU region showing a higher number of fields contaminated by weedy rice but lower in the number of weedy rice plants per unit area. However, the opposite tendency was found in NE and SW regions.

In the types of weedy rice, reddish-colored weedy rice occurred more than off-type rice in all 4 agronomic regions. A higher occurrence of reddish-colored weedy

rice was specially observed in NE and SW regions. Therefore, in these regions, there could be significant influence by weedy rice in terms of rice quality and yield.

The occurrence of weedy rice according to rice cultivation methods is shown in Table 3. Since this survey was carried out based on the proportional stratified sampling method, most of surveyed fields belonged to transplanting with 35-day-old seedling.

The percentage of fields infected by weedy rice was highest in water seeding cultivation (66.7%) compared to other cultivation methods. The number of weedy rice occurred per ha was 7,567 plants in direct seeding on dry paddy and 3,794 plants in water seeding. These results agree with other reports on the occurrence of more weedy rice under direct seeded cultivation than under transplanting cultivation (Ha & Son, 1996; Park et al, 1996; Son et al, 1995). This study also showed that occurrence of weedy rice in direct seeded fields was 5~9 times higher than that under 35-day-old seedling transplanting cultivation. Even though transplanting cultivation showed a lower occurrence of weedy rice plants, the percentage of fields contaminated by weedy rice was on the same level as direct seeding on dry paddy.

The occurrence of weedy rice influenced by transpl-

Table 4. Distribution of weedy rice in different transplanting (or seeding) time.

Transplanting time	No. of surveyed fields	No. of fields with weedy rice(%)	No. of weedy rice plants per ha (hill, %)		
			Off-type rice	Red rice	Sub-total
~ April 30	21	15 (71.4)†	1,140 (0.48)‡	3,561 (1.50)	4,701 (1.97)
May 1 ~ May 10	69	49 (71.0)	510 (0.21)	2,911 (1.22)	3,421 (1.44)
May 11 ~ May 20	951	597 (62.8)	293 (0.12)	459 (0.19)	752 (0.32)
May 21 ~ May 31	1,433	702 (49.0)	405 (0.17)	784 (0.33)	1,189 (0.50)
June 1 ~	16	5 (31.3)	839 (0.35)	159 (0.07)	998 (0.42)

† Percent of fields infested by weedy rice of total number of surveyed fields.
‡ Percent of weedy rice plants of total rice plants per ha.

Table 5. Distribution of weedy rice as influenced by years of self-produced seed use.

Years of self-produced seed use	No. of surveyed fields	No. of fields with weedy rice(%)	No. of weedy rice plants per ha (hill, %)		
			Off-type rice	Red rice	Sub-total
Certified seed	786	385 (49.0)†	166 (0.07)‡	375 (0.16)	541 (0.23)
1 year	419	238 (56.8)	695 (0.29)	485 (0.20)	1,180 (0.49)
2 years	701	341 (48.6)	236 (0.10)	655 (0.28)	891 (0.38)
3 years	389	253 (65.0)	197 (0.08)	1,286 (0.54)	1,483 (0.62)
Over 4 years	195	150 (76.9)	1,073 (0.45)	1,810 (0.76)	2,883 (1.21)

† Percent of fields infested by weedy rice of total number of surveyed fields.
‡ Percent of weedy rice plants of total rice plants per ha.

Table 6. Distribution of weedy rice in different maturing-type cultivars.

Maturing time	No. of surveyed fields	No. of fields with weedy rice(%)	No. of weedy rice plants per ha (hill, %)		
			Off-type rice	Red rice	Sub-total
Early maturing cultivars	132	83 (62.9)†	144 (0.06)‡	303 (0.13)	447 (0.19)
Medium maturing cultivars	755	411 (54.4)	425 (0.18)	613 (0.26)	1,038 (0.44)
Medium-late maturing cultivars	1,556	837 (53.8)	366 (0.15)	668 (0.28)	1,034 (0.43)
Others§	47	40 (78.7)	278 (0.12)	1,593 (0.67)	1,871 (0.79)

† Percent of fields infested by weedy rice of total number of surveyed fields.
‡ Percent of weedy rice plants of total rice plants per ha.
§ Unrecommended rice cultivars.

anting (seeding) times is shown in Table 4. The percent of fields infested by weedy rice and the number of weedy rice plants per unit area were higher in early transplanting (seeding) than late transplanting, and their occurrence was closely related with rice cultivation methods such as direct seeding cultivation (Table 3). Moreover, fifty percent of paddy fields were infested with weedy rice when transplanted at optimum time (May 10 through May 30) in Kyonggi region, indicating that more concerns needed to be addressed to weedy rice control in rice cultivation regardless of transplanting times and cultivation methods.

The occurrence of weedy rice according to the number of years of using self-produced farmer's seeds is shown in Table 5. Almost one thirds of surveyed field were sown with seeds harvested at home, and the longer self-produced seeds being used, the more weedy rice occurred in paddy fields.

Also, the number of weedy rice per 10 a was higher in the field planted by self-produced seeds than that of paddy fields sown with certified seeds. It was assumed that self-produced seeds by farmers should be contaminated by red rices as well as off-type rices due to lack of control during cultivation and harvesting, resulting in wide-spread contamination of weedy rice through seed exchange among farmers.

The occurrence of weedy rice in different mature-type cultivars is shown in Table 6. Differences among rice cultivars was small for occurrence of weedy rice, but the percent of fields contaminated by weedy rice was higher in the fields planted with early maturing cultivars than others. This tendency corresponded with the fact that early-maturing rice cultivars were usually cultivated in the NM region of Kyonggi-do.

Occurrence of weedy rice was lower in fields planted with recommended rice cultivars (early, medium, and medium-late maturing cultivars in Table 6). The seeds which are not registered as recommended cultivars (others in Table 6) had generally been produced by individual farmer and used without certification. This is likely a major factor for wide-spread occurrence of weedy rice.

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